

Table of Contents

1 Introduction

1.1 STATE OF CALIFORNIA COHO SALMON LISTING ACTIONS	1.1
1.2 FEDERAL COHO SALMON LISTING ACTIONS	1.2
1.3 STRATEGIC PLANNING FOR RECOVERY	1.2
1.3.1 FISH AND GAME COMMISSION ACTION	1.2
1.3.2 DEPARTMENT OF FISH AND GAME ACTION	1.3
1.3.3 RANGE-WIDE COHO SALMON RECOVERY TEAM	1.3
1.3.4 SHASTA-SCOTT RECOVERY TEAM	1.4
1.3.5 FEDERAL TECHNICAL RECOVERY TEAMS	1.4
1.4 RECOVERY STRATEGY FOR COHO SALMON IN CALIFORNIA	1.5
1.4.1 GENERAL GOALS	1.5
1.4.2 ELEMENTS NECESSARY TO ACHIEVE RECOVERY GOALS	1.6
1.4.3 IMPLEMENTATION	1.6
1.4.3.1 Interim Actions	1.7
1.4.3.2 Long-term Actions	1.7
1.4.4 ADAPTIVE MANAGEMENT	1.7

2 Biology

2.1 RANGE	2.1
2.2 EVOLUTIONARILY SIGNIFICANT UNITS	2.1
2.2.1 SOUTHERN OREGON/NORTHERN CALIFORNIA COASTS COHO ESU	2.2
2.2.2 CENTRAL CALIFORNIA COAST COHO ESU	2.5
2.3 PRESENT DISTRIBUTION	2.5
2.4 LIFE HISTORY	2.5
2.5 POPULATION STRUCTURE AND VIABILITY	2.9
2.5.1 POPULATION STRUCTURE	2.10
2.5.2 POPULATION VIABILITY	2.11
2.6 GENETICS	2.11
2.7 HABITAT REQUIREMENTS	2.13
2.7.1 HABITAT REQUIREMENTS FOR ADULTS	2.13
2.7.1.1 Migration	2.13
2.7.1.2 Spawning	2.17
2.7.2 HABITAT REQUIREMENTS FOR JUVENILES	2.18
2.7.2.1 Eggs and Alevin Incubation	2.18
2.7.2.2 Fry Emergence	2.18
2.7.2.3 Juvenile Rearing	2.19
2.7.2.4 Emigration	2.19
2.7.3 ESTUARINE HABITAT	2.20

2.7.4	SUMMARY OF ESSENTIAL HABITAT	2.20
2.7.4.1	Stream Vegetation	2.21
2.7.4.2	Large Woody Debris	2.21
2.7.4.3	Sediment and Substrate	2.21
2.7.4.4	Hydrological Regime	2.21
2.7.4.5	Water Temperature	2.23
2.7.4.6	Dissolved Oxygen	2.23

3 Threats

3.1	CLIMATIC VARIATION	3.1
3.1.1	DROUGHT	3.1
3.1.2	FLOODING	3.2
3.1.3	OCEAN CONDITIONS	3.2
3.2	DISEASE	3.3
3.3	PREDATION	3.3
3.3.1	FRESHWATER PREDATION	3.3
3.3.2	MARINE PREDATION	3.4
3.4	HATCHERIES	3.5
3.5	GENETIC DIVERSITY	3.5
3.6	LAND USES	3.8
3.6.1	FORESTRY ACTIVITIES	3.8
3.6.2	WATER DIVERSIONS AND FISH SCREENS	3.11
3.6.3	INSTREAM FLOWS	3.12
3.6.4	ARTIFICIAL BARRIERS	3.12
3.6.5	GRAVEL EXTRACTION	3.13
3.6.6	SUCTION DREDGING	3.14
3.6.7	STREAMBED ALTERATION	3.15
3.6.8	WATER QUALITY	3.15
3.6.9	AGRICULTURAL IMPACTS	3.15
3.6.10	URBANIZATION AND URBAN IMPACTS	3.19
3.6.10.1	Alteration of Natural Vegetation	3.19
3.6.10.2	Disrupted Hydrological Processes and Reduced Stream Complexity	3.19
3.6.10.3	Degradation of Soil Function	3.20
3.6.10.4	Impaired Water Quality	3.20
3.6.10.5	Barriers to Passage	3.21
3.6.10.6	Degraded Biological Diversity and Habitat Suitability	3.21
3.6.11	FISHING	3.22
3.6.12	ILLEGAL HARVEST	3.22

4 Recovery Goals and Delisting Criteria

4.1	FRAMEWORK FOR RECOVERY	4.2
4.1.1	RECOVERY GOALS AND DELISTING CRITERIA	4.3
4.1.1.1	Recovery Goals, Delisting Criteria, and Progress Evaluation	4.4
4.1.1.2	Recovery Units	4.6
4.1.2	DELISTING AND DOWNLISTING TARGETS	4.9
4.1.2.1	Targets for Coho Salmon Populations: Goals I, II, and III	4.9
4.1.2.2	Targets for Coho Salmon Habitat: Goals IV and V	4.10

4.2 FISHERIES RESTORATION GOAL	4.11
4.2.1 RECREATIONAL FISHING	4.12
4.2.2 COMMERCIAL FISHING	4.13
5 Elements Necessary for Recovery	
5.1 ROLE OF PUBLIC LANDS	5.1
5.1.1 FEDERAL LANDS	5.1
5.1.1.1 U.S. Forest Service	5.1
5.1.1.2 U.S. Bureau of Land Management	5.2
5.1.1.3 U.S. National Park Service	5.2
5.1.1.4 U.S. Department of Defense	5.2
5.1.1.5 U.S. Fish and Wildlife Service	5.5
5.1.1.6 U.S. Bureau of Reclamation	5.5
5.1.2 STATE LANDS	5.5
5.1.2.1 California Department of Parks and Recreation	5.5
5.1.2.2 California Department of Forestry and Fire Protection	5.5
5.1.2.3 California State Lands Commission	5.6
5.1.2.4 California Department of Fish and Game	5.6
5.1.3 COUNTY AND CITY LANDS	5.6
5.2 FUNDING FOR PRIVATE AND PUBLIC COOPERATION	5.6
5.2.1 EXISTING PROGRAMS	5.7
5.2.1.1 Fisheries Restoration Grants Program	5.7
5.2.1.2 California Department of Conservation Grant Program	5.8
5.2.1.3 Environmental Enhancement and Mitigation Program	5.8
5.2.1.4 Department of Water Resources Grant Program	5.9
5.2.1.5 California Coastal Conservancy Program	5.9
5.2.1.6 Watershed and Nonpoint Source Pollution Control Programs	5.9
5.2.1.7 Farm Bill Grants	5.10
5.2.1.8 NOAA Community-based Restoration Program	5.13
5.2.1.9 A Targeted Incentive Program	5.14
5.2.1.10 Other Programs	5.14
5.2.2 MINIMIZING SOCIAL AND ECONOMIC IMPACTS	5.14
5.2.3 VOLUNTARY INCENTIVES	5.14
5.3 OUTREACH AND EDUCATION	5.15
5.3.1 RECOVERY STRATEGY RECOMMENDATIONS	5.15
5.3.2 EDUCATION AND OUTREACH PLAN	5.15
5.3.2.1 School Curricula	5.15
5.3.2.2 Interpretive Media	5.16
5.4 ASSESSMENT, MONITORING, AND RESEARCH	5.16
5.4.1 PROGRAM FRAMEWORK	5.16
5.4.1.1 Scientific Planning and Prioritization	5.16
5.4.1.2 Evaluating Current Monitoring	5.17
5.4.1.3 Data Management	5.17
5.4.1.4 New Research	5.17
5.4.1.5 Program Reporting	5.19
5.4.2 ASSESSMENT	5.19

5.4.3	MONITORING	5.19
5.4.3.1	Three-tiered Monitoring Framework	5.20
5.4.3.2	Monitoring of Coho Salmon	5.21
5.4.4	NEW RESEARCH	5.22
5.4.5	ASSESSMENT, MONITORING, AND RESEARCH RECOMMENDATIONS	5.22
5.5	REGULATORY ROLE IN RECOVERY	5.22

6 Recovery Units and Watersheds

6.1	RECOVERY UNITS IN THE SONCC COHO ESU	6.1
6.1.1	ROGUE RIVER AND WINCHUCK RIVER HYDROLOGIC UNITS ..	6.1
6.1.1.1	Illinois River HSA	6.1
6.1.1.2	Winchuck River HSA	6.1
6.1.2	SMITH RIVER HYDROLOGIC UNIT	6.4
6.1.2.1	Mill Creek HSA	6.4
6.1.2.2	Wilson Creek HSA	6.4
6.1.3	KLAMATH RIVER HYDROLOGIC UNIT	6.9
6.1.3.1	Klamath Glen HSA	6.9
6.1.3.2	Orleans HSA	6.10
6.1.3.3	Ukonom HSA	6.10
6.1.3.4	Happy Camp HSA	6.10
6.1.3.5	Seiad Valley HSA	6.10
6.1.3.6	Beaver Creek HSA	6.10
6.1.3.7	Hornbrook HSA	6.10
6.1.3.8	Iron Gate HSA	6.11
6.1.3.9	Copco Lake HSA	6.11
6.1.4	SALMON RIVER HYDROLOGIC AREA	6.11
6.1.4.1	Lower Salmon HSA	6.11
6.1.4.2	Wooly Creek HSA	6.11
6.1.4.3	Sawyers Bar HSA	6.12
6.1.4.4	Cecilville HSA	6.12
6.1.5	SHASTA VALLEY HYDROLOGIC AREA	6.12
6.1.6	SCOTT RIVER HYDROLOGIC AREA	6.12
6.1.7	TRINITY RIVER HYDROLOGIC UNIT	6.15
6.1.7.1	Douglas City HSA	6.16
6.1.7.2	Grouse Creek HSA	6.16
6.1.7.3	Hyampom HSA	6.16
6.1.7.4	Hayfork HSA	6.16
6.1.8	MAD RIVER HYDROLOGIC UNIT	6.16
6.1.9	REDWOOD CREEK HYDROLOGIC UNIT	6.19
6.1.10	TRINIDAD HYDROLOGIC UNIT	6.19
6.1.10.1	Big Lagoon HSA	6.20
6.1.10.2	Little River HSA	6.20
6.1.11	EUREKA PLAIN HYDROLOGIC UNIT	6.20
6.1.12	EEL RIVER HYDROLOGIC UNIT	6.23
6.1.12.1	Ferndale HSA	6.24
6.1.12.2	Scotia HSA	6.24
6.1.12.3	South Fork Eel River HA	6.24

6.1.12.4	Weott HSA	6.24
6.1.12.5	Benbow HSA	6.24
6.1.12.6	Laytonville HSA	6.27
6.1.12.7	Outlet Creek HSA	6.27
6.1.13	CAPE MENDOCINO HYDROLOGIC UNIT	6.27
6.1.13.1	Northern Subbasin of Mattole HSA	6.28
6.1.13.2	Eastern Subbasin of Mattole HSA	6.28
6.1.13.3	Southern Subbasin of Mattole HSA	6.28
6.1.13.4	Western Subbasin of Mattole HSA	6.28
6.1.13.5	Estuary Subbasin of Mattole HSA	6.28
6.2	RECOVERY UNITS IN THE CCC COHO ESU	6.31
6.2.1	MENDOCINO COAST HYDROLOGIC UNIT	6.31
6.2.1.1	Albion River HSA	6.31
6.2.1.2	Big River HSA	6.34
6.2.1.3	Garcia River HSA	6.34
6.2.1.4	Navarro River HSA	6.34
6.2.1.5	Noyo River HSA	6.34
6.2.1.6	Ten Mile River HSA	6.34
6.2.1.7	Gualala River HSA	6.37
6.2.2	RUSSIAN RIVER HYDROLOGIC UNIT	6.37
6.2.2.1	Russian River Mainstem	6.38
6.2.2.2	Guerneville HSA	6.38
6.2.2.3	Austin Creek HSA	6.38
6.2.2.4	Warm Springs HSA	6.41
6.2.2.5	Mark West Creek HSA	6.41
6.2.2.6	Santa Rosa Creek HSA	6.41
6.2.2.7	Forsythe Creek HSA	6.42
6.2.2.8	Geyserville HSA	6.42
6.2.3	BODEGA AND MARIN COASTAL HYDROLOGIC UNITS	6.43
6.2.3.1	Salmon Creek HSA	6.43
6.2.3.2	Walker Creek HSA	6.43
6.2.3.3	Lagunitas Creek HSA	6.44
6.2.3.4	Bolinas HSA	6.44
6.2.4	SAN FRANCISCO BAY HYDROLOGIC UNITS	6.45
6.2.5	SAN MATEO HYDROLOGIC UNIT	6.45
6.2.5.1	San Gregorio Creek HSA	6.46
6.2.5.2	Año Nuevo (Gazos Creek) HSA	6.49
6.2.6	BIG BASIN HYDROLOGIC UNIT	6.49
6.2.6.1	Davenport HSA	6.50
6.2.6.2	San Lorenzo River HSA	6.50
6.2.6.3	Aptos-Soquel HSA	6.53
6.3	WATERSHED PRIORITIZATION	6.53
6.3.1	GENERAL PRINCIPLES	6.54
6.3.2	PRIORITIZATION PROCESS	6.55
6.3.2.1	Identify Refugia Watersheds and Risk of Extinction	6.55
6.3.2.2	Identify Restoration Potential	6.55
6.3.2.3	Identify Disconnected Habitats	6.56

7 Range-wide Recommendations

7.1 STREAM FLOW	7.1
7.2 WATER RIGHTS	7.2
7.3 FISH PASSAGE	7.3
7.4 POLLUTANTS	7.3
7.5 SEDIMENTS	7.4
7.6 WATER TEMPERATURE	7.4
7.7 LARGE WOODY DEBRIS	7.5
7.8 STREAM COMPLEXITY	7.5
7.9 REFUGIA	7.5
7.10 HABITAT FRAGMENTATION	7.6
7.11 COMPETITION	7.6
7.12 HATCHERY OPERATIONS, GENETICS, AND RELOCATION	7.6
7.13 RIPARIAN VEGETATION	7.6
7.14 ESTUARIES	7.7
7.15 LAND USE	7.7
7.16 PUBLIC OUTREACH	7.8
7.17 INTEGRATION WITH OTHER PLANS AND PROGRAMS	7.8
7.18 PERMITTING	7.10
7.19 WATERSHED PLANNING	7.11
7.20 ENFORCEMENT OF EXISTING LAWS	7.12
7.21 IMPLEMENTATION	7.13
7.22 INSTREAM GRAVEL MINING	7.14
7.23 ASSESSMENT, MONITORING, AND RESEARCH	7.14
7.24 TIMBER MANAGEMENT	7.15

8 Watershed Recommendations

8.1 SOUTHERN OREGON/NORTHERN CALIFORNIA COASTS ESU	8.1
8.1.1 ROGUE RIVER AND WINCHUCK RIVER HYDROLOGIC UNITS ..	8.1
8.1.1.1 Illinois River HSA	8.1
8.1.1.2 Winchuck River Hydrologic Unit/Winchuck River HSA	8.2
8.1.2 SMITH RIVER HYDROLOGIC UNIT	8.2
8.1.2.1 Mill Creek HSA	8.2
8.1.2.2 Wilson Creek HSA	8.3
8.1.2.3 Smith River Plain HSA	8.3
8.1.3 KLAMATH RIVER HYDROLOGIC UNIT	8.3
8.1.3.1 Klamath Glen HSA	8.4
8.1.3.2 Orleans HSA	8.7
8.1.3.3 Ukonom HSA	8.8
8.1.3.4 Happy Camp HSA	8.9
8.1.3.5 Seiad Valley HSA	8.11
8.1.3.6 Beaver Creek HSA	8.12
8.1.3.7 Hornbrook HSA	8.14
8.1.3.8 Iron Gate HSA	8.15
8.1.4 SALMON RIVER HYDROLOGIC AREA	8.16
8.1.4.1 Lower Salmon River HSA	8.16
8.1.4.2 Sawyers Bar HSA	8.17
8.1.5 SHASTA VALLEY AND SCOTT RIVER HYDROLOGIC AREAS	8.17

8.1.6	TRINITY RIVER HYDROLOGIC UNIT	8.19
8.1.6.1	Douglas City HSA	8.20
8.1.6.2	Grouse Creek HSA	8.20
8.1.6.3	Hyampom HSA	8.20
8.1.6.4	Hayfork HSA	8.20
8.1.7	MAD RIVER HYDROLOGIC UNIT	8.21
8.1.7.1	Blue Lake HSA and North Fork Mad HSA	8.22
8.1.7.2	Butler Valley HSA	8.23
8.1.8	REDWOOD CREEK HYDROLOGIC UNIT	8.23
8.1.9	TRINIDAD HYDROLOGIC UNIT	8.24
8.1.9.1	Big Lagoon HSA	8.24
8.1.9.2	Little River HSA	8.24
8.1.10	EUREKA PLAIN HYDROLOGIC UNIT	8.24
8.1.11	EEL RIVER HYDROLOGIC UNIT	8.27
8.1.11.1	Ferndale HSA	8.28
8.1.11.2	Van Duzen River HSA	8.28
8.1.11.3	Scotia HSA	8.28
8.1.11.4	South Fork Eel River HSA	8.28
8.1.11.5	Weott HSA	8.28
8.1.11.6	Benbow HSA	8.29
8.1.11.7	Laytonville HSA	8.29
8.1.11.8	Outlet Creek HSA	8.29
8.1.12	CAPE MENDOCINO HYDROLOGIC UNIT	8.30
8.1.12.1	Southern Subbasin Mattole River HSA	8.30
8.1.12.2	Western Subbasin Mattole River HSA	8.31
8.1.12.3	Northern Subbasin Mattole River HSA	8.32
8.1.12.4	Eastern Subbasin Mattole River HSA	8.32
8.2	CENTRAL CALIFORNIA COAST ESU	8.32
8.2.1	MENDOCINO COAST HYDROLOGIC UNIT	8.32
8.2.1.1	Albion River HSA	8.34
8.2.1.2	Big River HSA	8.35
8.2.1.3	Garcia River HSA	8.35
8.2.1.4	Navarro River HSA	8.36
8.2.1.5	Noyo River HSA	8.37
8.2.1.6	Ten Mile River HSA	8.38
8.2.1.7	Gualala River HSA	8.38
8.2.2	RUSSIAN RIVER HYDROLOGIC UNIT	8.39
8.2.2.1	Russian River Mainstem	8.41
8.2.2.2	Guerneville HSA	8.41
8.2.2.3	Austin Creek HSA	8.41
8.2.2.4	Warm Springs HSA	8.42
8.2.2.5	Mark West Creek HSA	8.42
8.2.2.6	Santa Rosa Creek HSA	8.42
8.2.2.7	Forsythe Creek HSA	8.42
8.2.2.8	Geyserville HSA	8.42
8.2.3	BODEGA AND MARIN COASTAL HYDROLOGIC UNITS	8.43
8.2.3.1	Salmon Creek HSA	8.44
8.2.3.2	Walker Creek HSA	8.44

8.2.3.3	Lagunitas Creek HSA	8.45
8.2.3.4	Bolinas HSA	8.46
8.2.4	SAN FRANCISCO BAY HYDROLOGIC UNITS	8.47
8.2.5	SAN MATEO HYDROLOGIC UNIT	8.47
8.2.5.1	San Gregorio Creek HSA and Pescadero Creek HSA	8.48
8.2.5.2	Año Nuevo (Gazos Creek) HSA	8.48
8.2.6	BIG BASIN HYDROLOGIC UNIT	8.49
8.2.6.1	Davenport HSA	8.49
8.2.6.2	San Lorenzo River HSA	8.50
8.2.6.3	Aptos-Soquel HSA	8.50

9 Implementation

9.1	AVAILABILITY OF FUNDS	9.1
9.2	WATERSHED PRIORITY	9.1
9.3	TASK LEVEL	9.1
9.4	TASK NUMBER	9.2
9.5	ACTION ENTITIES	9.2
9.6	ESTIMATED TIME	9.3
9.7	IMPLEMENTATION SCHEDULES	9.3

10 Shasta-Scott Pilot Program

10.1	FRAMEWORK FOR AGRICULTURAL ISSUES	10.1
10.2	ADMINISTRATION AND IMPLEMENTATION	10.2
10.3	SHASTA-SCOTT RECOMMENDATIONS AND IMPLEMENTATION SCHEDULE	10.3

11 Economics of Recovery

11.1	ECONOMIC BENEFITS	11.1
11.2	FISCAL COSTS AND SOCIOECONOMIC IMPACTS	11.1
11.2.1	UNIT COSTS	11.2
11.2.1.1	Fish Passage	11.3
11.2.1.2	Riparian Restoration	11.4
11.2.1.3	In-channel Restoration	11.4
11.2.1.4	Road Treatment and Decommissioning	11.4
11.2.1.5	Wetlands Restoration	11.4
11.2.1.6	Water Acquisition	11.5
11.2.1.7	Monitoring and Research	11.5
11.2.2	COST ESTIMATES	11.6

12 Process for Revising and Managing the Recovery Strategy

12.1	MANAGEMENT AND COORDINATION OF IMPLEMENTATION	12.1
12.2	TIMETABLE AND PROCESS FOR REPORTING AND REVISION	12.3
12.3	TIMETABLE CLARIFYING NON-SPECIFIC LONG-TERM GOALS	12.4
12.4	ADAPTIVE MANAGEMENT	12.4

13 References Cited 13.1

List of Tables

TABLE 2-1	California streams for which coho salmon genetic tissue samples have been collected, analyzed, and reported, 1982 to the present	2.12
TABLE 2-2	Freshwater habitats of the different life stages of coho salmon	2.21
TABLE 2-3	Fundamental habitat elements and suitable ranges for coho salmon life stages	2.22
TABLE 3-1	Identified concerns about maintenance of existing genetic diversity and possible causes of reduction of genetic diversity in California coho salmon	3.6
TABLE 3-2	Guidelines for number of breeders per generation and number of breeders per year needed to maintain genetic diversity in populations of California coho salmon	3.7
TABLE 3-3	Forestry activities and potential effects to stream environment, salmonid habitat, and salmonid biology	3.9
TABLE 3-4	Comparison of watercourse protection standards	3.10
TABLE 3-5	Major dams within the California portion of the SONCC Coho ESU that block coho salmon from accessing historical spawning and rearing habitat	3.14
TABLE 3-6	Major dams within the CCC Coho ESU that block coho salmon from accessing historical spawning and rearing habitat	3.14
TABLE 3-7	Clean Water Act §303(d) list of impaired water bodies within the range of coho salmon in California	3.16
TABLE 4-1	Delisting targets for the SONCC Coho ESU	4.7
TABLE 4-2	Downlisting targets for the CCC Coho ESU	4.8
TABLE 4-3	Delisting targets for the CCC Coho ESU	4.8
TABLE 4-4	Recovery units within the SONCC and CCC Coho ESUs	4.9
TABLE 5-1	Partial outline of potential ecological and land management variables for coho salmon recovery strategy assessment, monitoring, and research ..	5.18
TABLE 5-2	Existing laws, regulations, and permits that contribute to coho salmon recovery	5.23
TABLE 6-1	Recovery units and CALWATER watersheds in the SONCC Coho ESU ...	6.2
TABLE 6-2	Recovery units and CALWATER watersheds in the CCC Coho ESU ...	6.32
TABLE 9.1	Implementation schedule for range-wide recommendations	9.4
TABLE 9.2	Implementation schedule for SONCC Coho ESU	9.23
TABLE 9.3	Implementation schedule for CCC Coho ESU	9.65
TABLE 10.1	Recovery recommendations and implementation schedule for the Shasta-Scott Pilot Program	10.4
TABLE 11.1	Recovery strategy costs by Hydrologic Unit	11.8
TABLE 11.2	Range-wide costs	11.9
TABLE 11.3	Total estimated costs of coho salmon recovery	11.10
TABLE 11.4	Socioeconomic impacts of restoration	11.10
TABLE 11.5	Range-wide measured socioeconomic impacts	11.11

List of Figures

FIGURE 2-1	Historic and present ranges of coho salmon in California	2.3
FIGURE 2-2	Coho Evolutionarily Significant Units in California	2.4
FIGURE 2-3	Present distribution of coho salmon in the SONCC Coho ESU	2.7
FIGURE 2-4	Present distribution of coho salmon in the CCC Coho ESU	2.8
FIGURE 2-5	Calendar indicating the seasonal presence of coho salmon in California coastal watersheds	2.9
FIGURE 2-6	Dendrogram based on pairwise genetic distances (Cavalli-Sforza and Edwards 1967) between 26 samples of coho salmon from southern Oregon and California	2.14
FIGURE 2-7	Unrooted UPGMA phylogram showing chord distances (Cavalli-Sforza and Edwards 1967) among 33 California coho salmon populations after adjustments for admixture and family structure and pooling of homogeneous samples within drainages and sites	2.15
FIGURE 2-8	Unrooted UPGMA phylogram showing chord distances (Cavalli-Sforza and Edwards 1967) among 27 California coho salmon populations after adjustments for admixture and family structure, pooling of homogeneous samples within drainages and sites, and removal of Green Valley and Redwood Creek outliers shown in Figure 2-7	2.16
FIGURE 3-1	Monthly values for the Pacific interdecadal oscillation index: January 1900 to April 2003	3.3
FIGURE 4-1	The process of coho salmon recovery and fishery restoration	4.1
FIGURE 5-1	Land ownership in the SONCC Coho ESU	5.3
FIGURE 5-2	Land ownership in the CCC Coho ESU	5.4
FIGURE 6-1	Recovery units in the California portion of the SONCC Coho ESU	6.5
FIGURE 6-2	Hydrologic Subareas in the California portion of the SONCC Coho ESU	6.6
FIGURE 6-3	Rogue River and Klamath River Hydrologic Units	6.7
FIGURE 6-4	Winchuck River and Smith River Hydrologic Units	6.8
FIGURE 6-5	Salmon River Hydrologic Area	6.13
FIGURE 6-6	Shasta Valley Hydrologic Area	6.14
FIGURE 6-7	Scott River Hydrologic Area	6.17
FIGURE 6-8	Trinity River Hydrologic Unit	6.18
FIGURE 6-9	Mad River Hydrologic Unit	6.21
FIGURE 6-10	Redwood Creek and Trinidad Hydrologic Units	6.22
FIGURE 6-11	Eureka Plain Hydrologic Unit	6.25
FIGURE 6-12	Eel River Hydrologic Unit	6.26
FIGURE 6-13	Cape Mendocino Hydrologic Unit	6.29
FIGURE 6-14	Recovery Units in the CCC Coho ESU	6.30
FIGURE 6-15	Hydrologic Subareas in the CCC Coho ESU	6.35
FIGURE 6-16	Mendocino Coast Hydrologic Unit (North)	6.36
FIGURE 6-17	Mendocino Coast Hydrologic Unit (South)	6.39
FIGURE 6-18	Russian River Hydrologic Unit	6.40
FIGURE 6-19	Bodega and Marin Coastal Hydrologic Units	6.47
FIGURE 6-20	San Francisco Bay Hydrologic Units	6.48
FIGURE 6-21	San Mateo Hydrologic Unit	6.51
FIGURE 6-22	Big Basin Hydrologic Unit	6.52
FIGURE 6-23	Consistent presence of coho salmon in the SONCC Coho ESU	6.57
FIGURE 6-24	Consistent presence of coho salmon in the CCC Coho ESU	6.58

FIGURE 6-25 Risk of extinction in watersheds in the SONCC Coho ESU	6.59
FIGURE 6-26 Risk of extinction in watersheds in the CCC Coho ESU	6.60
FIGURE 6-27 Restoration and management potential in the SONCC Coho ESU	6.61
FIGURE 6-28 Restoration and management potential in the CCC Coho ESU	6.62
FIGURE 6-29 Disconnected habitat in the SONCC Coho ESU	6.63
FIGURE 6-30 Disconnected habitat in the CCC Coho ESU	6.64
FIGURE 12-1 Adaptive management cycle	12.5

List of Appendices

APPENDIX A: Abbreviations and Acronyms
APPENDIX B: Glossary
APPENDIX C: Other Species at Risk
APPENDIX D: Key Streams and Rivers
APPENDIX E: Watershed Groups and Gap Analysis
APPENDIX F: Watershed Prioritization
APPENDIX G: Role of Existing Hatcheries
APPENDIX H: Recommended Guidelines for Recovery Hatcheries
APPENDIX I: Cost and Socioeconomic Impacts